Equipments & Materials Processing

GaN and AlN substrate start-up **Kyma Technologies** (Raleigh, NC, USA) has raised US$2.6m in 1st-round funding from venture and strategic investors to complete R&D and generate first revenues.

Kyma plans a 2nd round in Q2/2002 to begin production.

Start-up **Powdec KK** has been launched by former Sony Corp staff to mass-produce GaN epi-wafers (led by researcher Hiroji Kawai, who developed technology to make uniform GaN wafers). It plans to start shipping 4" wafers as early as next summer.

Sony has applied for a patent (to be licensed to the start-up).

Powdec KK is aiming for annual sales of ¥1bn in three years.

To supply its growing customer base **NOVASiC** - which provides wafer polishing and reclaim for 6H-SiC, 4H-SiC, sapphire and related materials - has moved to the Savoie Technolac, Le Bourget du Lac, France (Tel: +33-4-79-24-47-80), increasing capacity tenfold.

NOVASiC says it can guarantee a RMS surface roughness =1Å (Si Face on 10x10µm field with AFM) and show atomic steps (so wafers are free of sub-surface damaged). (See paper "*Atomic steps observation on 6H and 15R-SiC polished surface*" presented at the *ICSCRM* conference.)

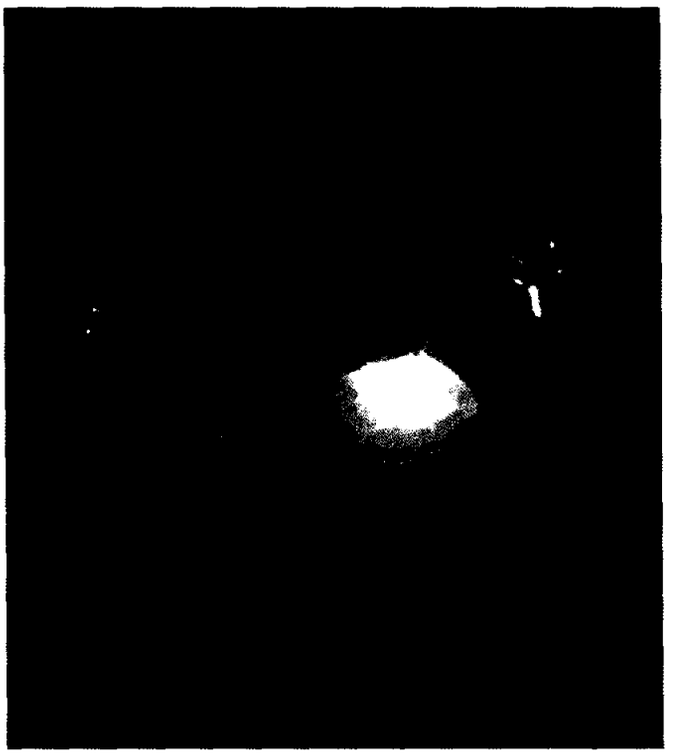
Union Minière (Brussels, Belgium) has changed its name to **Umicore** after management decided that the old name no longer reflected its current operations. The company still has three groups: Copper & Precious Metals; Zinc; and Advanced Materials (which makes germanium substrates, in particular for solar cells).

First 35 mm bulk GaN substrate

Technologies and Devices International Inc (Gaithersburg, Maryland, USA) says it has produced the industry's first true GaN bulk substrate, aiming to replace sapphire, SiC or silicon as a commercially viable substrate for GaN-based devices such as blue-spectrum LEDs and lasers and microelectronic devices. Initial samples of its "True Bulk GaN" were previewed at July's *International Conference on Nitride Semiconductors* (ICNS) in Denver, CO, USA (to be detailed in a following issue).

TDI's sample boules and polished wafers are 1.5" (35 mm) in diameter and have been characterized as single-crystal material with "fairly high crystal quality with low dislocation density", according to transmission electron microscopy by Professor S Mahajan at Arizona State University.

"The performance and lifetimes of all GaN-based device designs will be significantly enhanced by using bulk GaN versus GaN layers grown epitaxially on non-native substrates such as SiC or sapphire," says President and CEO Dr Vladimir A Dmitriev.



Pictured - Light emission from an LED fabricated on TDI's bulk GaN substrate. One of the electrodes is placed on top of the LED structure and the other is connected to the conducting GaN substrate.

TDI has so far received support from the US Department of Defense's Office of Naval Research, BMDO and other US government funding sources. Other technical development has come with R&D teams including Cornell University, NRL, and NIST in the USA, and Erlangen University in Germany.

TDI is developing proprietary crystal growth and wafer fabrication technology to commercialize their new low-defect density GaN substrates and is in discussions with potential commercial development and manufacturing partners for volume production. Dmitriev reckons that TDI's bulk GaN could be in commercial use for blue-spectrum high-brightness LEDs and lasers and microelectronic devices within a year.

Isotopically pure ZnO substrates

Cermet Inc (Atlanta, GA, USA) - which develops single-crystal zinc oxide (as a replacement for aluminum oxide and silicon carbide substrates for GaN opto devices) - and **Isonics Corp** (Golden, CO, USA) - which develops isotopically pure silicon - have announced a 12-18 month joint development program to evaluate isotopically pure zinc-64 oxide as a substrate for blue LEDs and lasers.

Cermet president Jeff Nause says "Proper thermal management is critical for many GaN devices currently under development. If a meaningful improvement in thermal conductivity can be obtained for ZnO, it could mean improved lifetimes and reliability for GaN devices."

Isonics will supply isotopically pure ZnO powder that will be converted into single-crystal wafers by Cermet. Thermal conductivity and other properties will be measured.

Isonics will also supply isotopically pure diethyl zinc for Cermet to fabricate MOCVD-based devices.